

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Masahiro YAMAKAWA et al.

Application No.: 10/549,480

Confirmation No.: 8164

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Art Unit: 1713

For: BINDER COMPOSITION FOR ELECTRODE
FOR ELECTRIC DOUBLE LAYER
CAPACITOR

Examiner: K. P. Reddy

DECLARATION PURSUANT TO 37 C.F.R. §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Masahiro Yamakawa, declare and say as follows:

1. I am familiar with U.S. Application Serial No. 10/549,480, of which I am a co-inventor. I conducted the following experiment. This experiment demonstrates the superior and unexpected distinctions between the binder of the present invention and that of Yamakawa (U.S. 6,656,633) (hereinafter "Yamakawa '663").

Experimental report

OBJECT

An object of this experimental report is to investigate an effect of adding "multifunctional ethylenically unsaturated carboxylic acid ester" to a binder composition for an electrode for an electric double layer capacitor.

EXPERIMENT

Binder compositions are listed in Table-1 below showing a mass % of components therein.

(Table-1)

	Binder		
	NO.1	No.2	NO.3
n-Butyl acrylate	86	86	-
2-Ethylhexyl acrylate	-	-	80
Methacrylonitrile	12	12	15
Diethylene glycol dimethacrylate	2	-	-
Acrylic acid	-	2	8

The binder No.1 to No.3 are evaluated by "Swelling ratio to electrolytic solution" "Peel strength" "Initial discharge capacity" and "Discharge capacity after 100 hours at 70 degree C".

RESULT

The results are shown in Table-2 below.

(Table-2)

	No.1	No.2	No.3
Swelling ratio to electrolytic solution	1.3	2.0	1.7
Peel strength (N/cm)	0.15	0.17	0.18
Initial discharge capacity (mWh/g)	17.2	15.7	16.0
Discharge capacity after 100 hours at 70°C (mWh/g)	16.3	12.3	13.2

The binder of Yamakawa '663 (No.2 and No.3) comprises an ethylenically unsaturated carboxylic acid, but does not comprise multifunctional ethylenically unsaturated carboxylic acid ester. The binder of the present invention (No.1) comprises multifunctional ethylenically unsaturated carboxylic acid ester, but does not comprise an ethylenically unsaturated carboxylic acid.

Comparing the binder No.1 to binders No.2 and No.3 of Yamakawa '663, the binders No.2 and No.3 showed increase of peel strength, but swelling ratio to electrolytic solution was also increased, and the discharge capacities (Initial and after heat treatment) were significantly deteriorated.

DISCUSSION

Increased swelling ratio to electrolytic solution causes increased covering area on a surface of active carbon by the binder, or increased internal resistance of electrode, therefore the discharge capacities were made to be decreased. In the present invention, it is my belief that multifunctional ethylenically unsaturated carboxylic acid ester produces cross-linking structure

in the binder, therefore the swelling of the binder in the electrolytic solution is suppressed, and deterioration of the discharge capacities is prevented.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Masahiro Yamakawa

Signature

Masahiro Yamakawa

Typed or Printed Name

08/08/2007

Date